

the condensation from vapor to water for an inch of rain to the square mile is estimated as equivalent to the work done by 100,000,000 horse-power for half an hour. Consider then the sweep of a wind, five hundred miles wide and three miles high, blowing for an hour at the rate of twenty miles. The force of the mightiest explosion with all its gas put forth into the air is, in comparison, less than a drop in a bucket.

First and last, rainfall is always concerned with temperature in its relation to the aqueous vapor. Air at different temperatures will hold different quantities of water-vapor which is an invisible gas and lighter than the air itself. For example, at 80° F. two cubic feet of air will sustain 22 grains weight of vapor; at 60° F. the same measure would hold 11½, but at 32° only 4½ grains. Any additional moisture would be condensed at those temperatures, or a lowering of the temperature of the saturated air would have the same effect, namely, condensation. At ordinary temperatures the capacity of the air for vapor is doubled for every 18° F. Cooling the air by mixture of a cold upper current with a lower warm and vapor-laden one, or the meeting of tropical and polar winds in circulating storms, or the impinging of a warm and moist air on a cold surface would condense the vapor into dew, fog, rain or snow; on the contrary a warm surface would evaporate water by the conduction of the heat from it to the water. Until it can be shown that the temperature of the air can be controlled by gigantic cooling operations we may look in vain for any alteration in the natural and well established order of events by way of the production of artificial rain.

In ancient times and long before European settlement, trees seem to have flourished in the Oamaru district, for I am told that big roots are still found in the soil, but, except around the old homesteads, the country is now bare of trees. Around their homes the settlers have mostly planted pines which have flourished wonderfully, but if larger and more varied plantations were made, particularly in belts intercepting the north-west and southwest winds, though they might not increase the rainfall yet the trees would act as shelters and windbreaks, and would also conserve the rainfall which now runs off in floods or evaporates in hot, dry weather. Where possible, the planting of deep-rooted rather than surface-rooting trees of a deciduous kind would bring up water from the lower water-tables and not only prevent surface evaporation by the winds, but also, as they transpire freely in the summer, create a beneficial humidity in their neighborhood. The excessive heat of a bare, sun-baked soil drives away the rain from a drought-stricken district and thus diminishes the "probability of rain" which otherwise could, from time to time, be reasonably expected. So far as one can see the only objections which can be urged against the planting of trees are the occupation of fertile lands by comparatively unproductive trees and the possible harboring of the small-bird pest. The losses, however, would undoubtedly be more than compensated for by wider general benefits, and the whole question is one of reforestation, which assuredly concerns the community at large, and could with advantage be dealt with by local or general government regulations.

Action with regard to both the planting and destruction of the trees is a matter of vital importance to the country. Whether forest trees increase the rainfall or are themselves the result of an abundant precipitation is not a question I would raise at the present time, but rather considerations of evaporation, shelter, run-off, etc., as affected by tree-planting, and are of more than passing interest to the people of Oamaru.

In conclusion I would like to remark that tho our seasons are usually so temperate, regular, and fruitful, yet climatic variations are of the greatest concern to the country.

SCHOOLBOYS' WEATHER OBSERVATIONS.

An interesting method of instructing boys in that part of nature study pertaining to the atmosphere has been devised by John Reid, the head-master of the Reckleford Council School at Yeovil. Each day of the school week several boys are sent to the corporation gas works to copy the records of barometer movements and rainfall there kept, one or two less experienced lads accompanying them. Meantime other boys note the direction of the wind and record the temperature from readings of thermometers hung in the open on the north and south sides of the school. The teacher of the class then enters the particulars on a sheet, and encourages the scholars to make deductions from the collected data. The boys copy the results, and every Friday they write an account of their observations in the form of "general remarks" on the week's weather.—*London Standard*.

The practise of requiring scholars, boys and girls, in the lower school grades to observe, record, and discuss meteorological phenomena was introduced by the Editor into the Normal School at Washington, D. C., in 1882, and has since been tried with great success in all portions of the United States—being heartily supported as an important branch of "Nature Study." The weather maps and forecasts bring the importance of this subject home to the whole community. The above extract from a London paper shows that our science is also being emphasized in the English Public Schools.—*C. A.*

INTERNATIONAL EXCHANGE SERVICE.

Owing to some recent irregularities in the transmission of publications it has occurred to the Editor that possibly many foreign subscribers, exchanges, and recipients of the MONTHLY WEATHER REVIEW are not fully apprised of the workings of the service established by nearly all national governments as an outgrowth and development of the original Smithsonian system. We, therefore, reproduce a circular letter issued by that Institution on behalf of the U. S. International Exchange Service. Any further details desired can be had by addressing the Secretary of the Smithsonian Institution.

In effecting the distribution of its first publications abroad, the Smithsonian Institution established relations with certain foreign scientific societies and libraries, by means of which it was enabled to assist materially institutions and individuals of this country in the transmission of their publications abroad, and also foreign societies and individuals in distributing their publications in the United States.

In recent years the Smithsonian Institution has been recognized by the United States Government as in charge of its official Exchange Bureau, through which the publications authorized by Congress are exchanged for those of other governments; and by a formal treaty it acts as intermediary between the learned bodies and literary and scientific societies of the contracting states for the reception and transmission of their publications.

Attention is called to the fact that this is not a domestic, but an international exchange service, and is used to facilitate exchanges, not within the United States, but between the United States and other countries only. As exchanges from domestic sources for addresses in Hawaii, the Philippine Islands, Porto Rico, Guam, The Canal Zone, and other territory subject to the jurisdiction of the United States do not come within the designation "international," they are not accepted for transmission.

Packages prepared in accordance with the rules enumerated below will be received by the Smithsonian Institution from persons or institutions of learning in the United States and forwarded to their destinations through its own agents, or through the various exchange bureaus in other countries. The Smithsonian agents and these bureaus will likewise receive from correspondents in their countries such publications for addresses in the United States and territories subject to its jurisdiction as may be delivered to them under rules similar to those prescribed herein, and will forward them to Washington, after which the Institution will undertake their distribution.

On the receipt of a consignment from a domestic source it is assigned an "Invoice Number," this number being placed on each package contained in the consignment. A record is then made of the entire list of packages under the sender's name, and the separate packages are entered under the name of the person or office addressed. An account is thus established with every correspondent of the Institution, which shows readily what packages each one has sent or received through the Exchange Service. The books are then packed in boxes with contributions from other senders for the same country, and are forwarded by fast freight to the bureau or agency abroad which has undertaken to distribute exchanges in that country. To Great Britain and Germany, where paid agencies of the Institution are maintained, shipments are made weekly; to all other countries transmissions are made at intervals not exceeding one month.